Distribution and abundance of four-toed salamanders (*Hemidactylium scutatum*) at Cape Cod National Seashore, with Emphasis on the Herring River Drainage

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INTRODUCTION

- The four-toed salamander (*Hemidactylium scutatum*) is a Massachusetts, “Species of Special Concern”
- Its eggs are laid terrestrially, above standing water.
- It nests in mosses, esp. *Sphagnum,* above water in freshwater habitats.
- It is a vernal pond facultative species.

- Since the majority of four-toed salamanders recorded at Cape Cod National Seashore (CACO) were in or adjacent to wetlands associated with the Herring River in Wellfleet, a tidally restricted system proposed for tidal flow restoration. Data were needed to assist planning for restoration.

- Our goals were: (1) To determine the distribution and abundance of *H. scutatum* within the Herring River system of Wellfleet, and (2) to determine the distribution and relative abundance of *H. scutatum* throughout CACO to compare with the Herring River system.

METHODS

- Ten areas within the Herring River System were sampled with 17, one hour time-constrained searches. Nineteen sites not associated with the Herring River were also sampled with time constrained searches. Most of these were isolated wetlands (vernal ponds).

- Comparisons were made between sites within the Herring River versus all others, between isolated wetlands versus riparian wetlands, and between Herring River sites versus isolated wetlands. Comparisons were made with a two-tailed Fisher’s exact test, and a One way analysis of variance.

Searching for H. scutatum nest

RESULTS

- *H. scutatum* were detected in 7/10 sites within the Herring River system, 11/19 sites outside of the Herring River, 9/12 riparian sites, and 9/17 isolated wetlands.

- There were no significant differences in the frequency of occurrence of *H. scutatum* between Herring River v. all other sites, riparian v. isolated sites, and Herring River v. isolated sites.

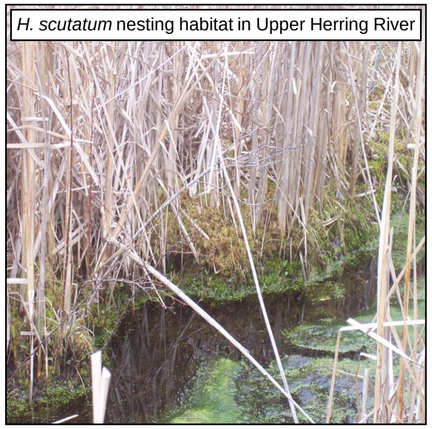
- Mean abundance was 7.58 nesting females/search hour at Herring River sites, 3.37 at all other sites, 8.31 at riparian sites, and 2.35 at isolated wetlands.

- Differences in mean abundance between Herring River sites and all other sites were not significant, but there were significant differences in abundance between Herring River (HR) v. isolated sites and between riparian v. isolated site (Table 1).

H. scutatum eggs

Table 1. Mean abundance of nesting females and frequency of occurrence

Sites	Mean Females	ANOVA	Frequency Occurrence	Fisher's Exact Test	n
HR	7.58	F1,27=2.56, *p* =0.121	70%	*p* =0.7657	10
all others	3.37		58%		19
riparian	8.31	F1,27=6.21 *p* =0.019	75%	*p* =0.7634	12
isolated	2.35		53%		17
HR	7.58	F1,25=5.29, *p* =0.03	70%	*p* =0.7521	10
isolated	2.35		53%		17



H. scutatum nesting habitat in Upper Herring River

H. scutatum at nest

CONCLUSIONS

- Abundance is greater in Herring River/riparian habitats at CACO than most isolated wetlands.

- Culverts and ditching have increased amount of freshwater habitat and provide longer hydroperiod than most vernal ponds. Abundance is also high in isolated sites with extensive *Sphagnum* at edge of deep water- but such sites are not common.

- Consider balancing restoration of tidally restricted marshes and protection of threatened and endangered species by controlling the degree or extent of tidal restoration.

- By this balancing, we can restore most of Herring River system while also protecting most of the sites important to four-toed salamanders.